The Intelligent Paint Solution

ABB Integrated Process System

ABB Flexible Automation

ABB

Paint Automation
ABB Flexible Automation has developed the Integrated Process System (IPS) which will provide the world of modern manufacturing with a high finish quality, optimum use of paint material, low cycle times, accurate and fast process control, easy collection of production statistics, and ease of use.

ABB’s unique IPS system features closed loop regulation and high-speed control for paint and airflow adjustment. This minimizes overspray and secures a uniform paint thickness. Combining this with high system flexibility and process logging/reporting, IPS will increase your cost effectiveness as well as finish quality.

The IPS design is based on an open, flexible and adaptable architecture philosophy. Various devices such as spray guns, bells, gear pumps and sensors are supported by the system. New devices can be easily employed by configuring the system with the correct device parameters, and typically without system programming. The system can be set-up with a practically unlimited number of devices. This flexibility has been achieved by utilising modern object-oriented software and hardware development methodologies. As a result, your IPS system will have a long life and be adaptable to new materials and equipment requirements.

In today’s competitive climate manufactures are constantly looking for more cost-effective, high-quality paint application solutions. Thanks to the accuracy, process control and flexibility of IPS you will now finish best in class.
in class
Being one with

Robots and Motion - Paint Process Control. Integrating this was our challenge - IPS the Solution.
Integrating the paint control into the robot controller was the first step only. Our goal was to achieve total control of the paint process. Once devices such as I/P transducers, gear pumps, etc. are applied, physical delay problems are introduced into the system. These delays can be mechanical, electrical, physical or a combination of these. To obtain a high accuracy of synchronisation between the arm movement and the process flow changes, a smart delay compensation algorithm has been developed. IPS devices are compensated for proportional to the commanded flow. This gives a higher accuracy than traditional systems available in the market.

The Motion Path Synchronisation mechanism is an important part of our efforts to continuously increase the transfer efficiency. By means of high precision gun needle and paint flow triggering synchronised with the robot arm movement the system is able to decrease overspray to an absolute minimum.

All this makes the system highly flexible and adaptable to current and future demands for process control.
When it comes to high transfer efficiency, IPS is a shining system.

The IPS system is based on closed loop regulation and high-speed control for paint and airflow regulation.
The system’s dynamic feed forward mechanisms allow the IPS to respond very quickly and accurately. The dynamic part of this mechanism updates the feed forward data with correct values whenever physical changes in the environment or the equipment so require. Thanks to the precision provided by the feed forward mechanism overspray is reduced, which increases the transfer efficiency.

Fine tuned and responsive PID regulators make sure that the variations are compensated for, always keeping the commanded flow rate within strict tolerances. As a result the system applies a uniform film build with specified thickness all over the object, adding to the transfer efficiency.

Different colours of paint have different characteristics. The IPS system has a built in function which takes care of a number of different colours. The Dynamic Feed Forward system also takes into consideration the characteristics of the colour being used. This contributes strongly to the application of the correct film build and quality.
The "intelligent" and adaptable IPS software continuously monitors the equipment and environment.

Changes in viscosity, temperature and wear and tear are quickly registered and remembered, and used to obtain a constant, optimal paint result. This "state of the art" process control system ensures high quality manufacturing and cost savings.

PaintWare is designed to support dedicated RAPID data types and instructions for efficient IPS control. Parameter values for the spray gun are organized into Brush Tables. This allows the programmer to select the correct brush size for the object to be painted. Different paint material characteristics are taken into consideration. This helps apply the correct film build and quality.

In order for the operator to give set value commands to the IPS system, dedicated Paintware RAPID instructions are being used as shown in the example to the right.

The "PaintL" move instruction has process events turning on/off the gun or selecting different brush sizes. This provides for accurate and fast triggering of brushes on various types of objects.

A process event is defined as a plane in space. When the robot crosses this invisible border, the brush is activated. These process events are independent of the robot positions, so you can move your robot program positions without having to edit the process events!

User-friendly software tools help you set up and operate the IPS system quickly and efficiently. A virtual IPS system can be run on your PC, useful for training and simulation.
Take a b
IPS will keep watch

Photo: NPS
The Regulator Compensation Limit Supervision is a very powerful mechanism that will enable you to identify problem areas before a breakdown occurs. This contributes to a higher uptime of the system and ensures that the system performs within specified operation limits. Pre-programmed limits may be set up for all input signals of the IPS system.

If the limits are reached, automatic shutdown may be activated by the IPS system itself, or a signal may be sent to a trap routine in the motion controller for more dedicated failure handling tailored to the actual installation. The IPS system will automatically compensate for any equipment wear, ensuring that the correct flow rate is produced. If the input pressure changes, the system will compensate and produce the correct flow rate.

The system is also designed to monitor wear over time. A warning will be issued, allowing the operator to take corrective actions.

If, however, the error limit is exceeded, an error message will be issued and the system will either automatically stop, or a signal may be sent to a trap handler in the motion controller for error handling.

In connection with the control of color change valves, the IPS system has the possibility to define a group of digital outputs that comprise a color changer. The outputs of this group can be interlocked so that only one output is active at any given time. Also the system will make sure that there is a safe zone between the closing of one valve until another is opened to compensate for physical delays in the valves. This function is a very useful safety feature to ensure that different colors are not mixed.

The IPS system has a built in feature that makes it possible to detect a broken cable or defective sensor. Whenever this happens the system will issue an error message and automatically enter open loop operation mode if so configured, using data stored by the dynamic feed forward mechanism.

In the case of a Bell Rotation speed feedback failure a specially designed algorithm will take care of the set value differences necessary to keep a close to constant speed between no paint flow and different paint flows. The system may now operate in open loop operation mode until it is possible to enter the booth and perform repair. This will drastically increase uptime in the case of sensor or cable failure.

The IPS system features a powerful Process Logging function that allows you to monitor system performance. All kind of signals, including paint, air volume and pressure, may be logged into files for later inspection or sent via communication networks to a supervisory system.

The IPS system will keep accumulated values and mean values of the items updated in real time. This highly flexible logging system allows you to configure any data for performance monitoring and quality assurance. Based on these data the necessary adjustments can be made to further improve your performance and cost effectiveness, and help you finish best in class.